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# A SUMMARY OF THE POPULATION OF INJURIOUS INSECTS IN KANSAS FOR 1932*

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The methods used in gathering the information for this summary and the general plan of the work varied in no essential way from those followed in the report for 1931(2). The questionnaire replies showed some improvement and, with this summary in mind, the authors made more observations during the year. Consequently, it is believed that this summary represents some improvement over the previous one. It is intended to continue gathering information of this kind and to publish an annual summary of this nature.

Somewhat more frequent reference has been made to the crop areas or agricultural districts of the state (Fig. 1). In the final analysis, there probably is very little difference in the population of an insect in the counties of each crop area.

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*Contribution No. 409 from the Department of Entomology.

(1) Dean H. J. Umberger of the Extension Division cooperated in gathering information included in this summary by sending out two sets of questionnaires to the county farm agents; Mr. Floyd K. Reed, U. S. Crop Statistician, Topeka, Kansas, cooperated by sending out about 200 questionnaires to leading farmers of the state; Prof. H. R. Bryson of the Department of Entomology made available his reports to the Insect Pest Survey. Prof. Geo. A. Dean and the rest of the Entomology staff reported observations which have been included. The authors acknowledge with sincere thanks this generous cooperation and assistance. This summary embodies results obtained on experiment station project No. 6.

(2) Smith, Roger C. A Summary of the Population of Injurious Insects in Kansas for 1931. Jour. Kans. Ent. Soc., 5:65-92, 1932, 1 pl,

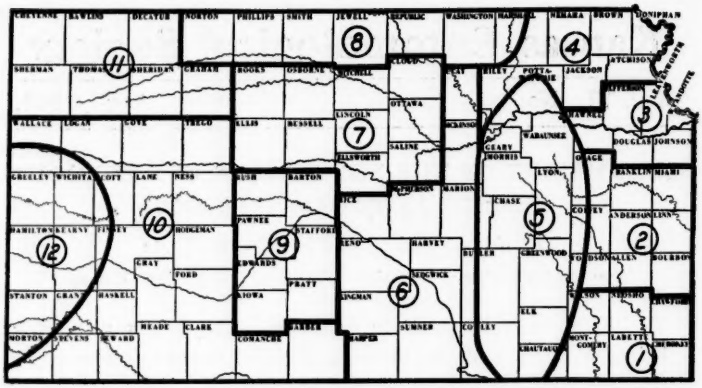


Figure 1—Type-of-farming areas in Kansas. (Fig. 18 of Kans. Agri. Exp. Sta, Bul, No, 251, 1930, which see for detailed explanation of the areas.) Briefly, the areas are: A. Eastern Kansas—1, 2, general farming areas; 3, Kaw Valley, potato and legume area; 4, corn belt and northeastern apple district; 5, Long grass or "flint hills" section. B. Central Kansas—6, 7, 9, wheat belt: 8, central corn belt. C. Western Kansas—10, 11, 12, western

## Summary of the Weather of Kansas for 1932 (3)

TABLE I - SUMMARY OF WEATHER DATA FOR THE STATE OF KANSAS FOR THE ENTIRE YEAR, Sept. 1, 1932 to Dec. 31, 1932

| Year | Month | Temperature | | | | | Precipitation (in inches) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | State Average | Maximum | Minimum | Average for 45 years | Departure from normal | State Average | Average for 45 years | Departure from normal | Eastern third | Middle third | Western third |
| 1931 | September | 77.5° | 111° | 31° | 69.6° | +8.2° | 2.50 | 2.80 | -0.16 | 4.52 | 2.34 | 0.64 |
| 1931 | October | 61.7° | 99° | 10° | 56.9° | +4.8° | 1.60 | 2.01 | -0.52 | 2.36 | 1.49 | 0.96 |
| 1931 | November | 46.2° | 87° | 1° | 41.2° | +2.6° | 4.46 | 1.29 | +1.11 | 8.08 | 4.11 | 1.19 |
| 1931 | December | 18.9° | 75° | 2° | 32.7° | +7.0° | 0.65 | 0.86 | -0.19 | 1.09 | 0.58 | 0.27 |
| 1932 | January | 28.7° | 67° | -14° | 29.4° | -0.8° | 1.33 | 0.67 | +0.71 | 1.41 | 1.50 | 1.06 |
| 1932 | February | 40.4° | 84° | - 7° | 33.0° | +6.7° | 0.71 | 1.01 | -0.10 | 0.58 | 0.82 | 0.41 |
| 1932 | March | 16.9° | 54° | -12° | 41.0° | -6.7° | 0.89 | 1.47 | -0.59 | 1.07 | 0.78 | 0.83 |
| 1932 | April | 57.5° | 92° | 18° | 54.7° | +1.4° | 2.21 | 2.66 | -0.48 | 2.71 | 1.55 | 2.34 |
| 1932 | May | 66.9° | 95° | 30° | 61.6° | +2.0° | 2.25 | 1.71 | -1.40 | 2.90 | 2.61 | 1.21 |
| 1932 | June | 71.4° | 105° | 44° | 71.5° | -0.1° | 5.71 | 4.07 | +1.65 | 5.98 | 5.66 | 5.56 |
| 1932 | July | 81.6° | 110° | 50° | 78.5° | +1.4° | 1.12 | 1.36 | -0.24 | 4.37 | 1.20 | 1.78 |
| 1932 | August | 79.1° | 107° | 48° | 77.1° | +2.0° | 2.92 | 1.17 | -0.29 | 1.51 | 1.72 | 1.53 |
| 1932 | September | 68.5° | 101° | 35° | 69.5° | -0.8° | 2.15 | 2.76 | -0.72 | 2.79 | 2.38 | 1.28 |
| 1932 | October | 55.2° | 92° | 14° | 56.8° | -1.7° | 0.99 | 1.99 | -1.12 | 1.17 | 0.99 | 0.62 |
| 1932 | November | 41.0° | 82° | - 2° | 43.1° | -1.0° | 0.32 | 1.27 | -1.04 | 0.68 | 0.17 | 0.10 |
| 1932 | December | 28.1° | 78° | -26° | 29.1° | -1.8° | 1.14 | 0.86 | -0.28 | 2.11 | 0.88 | 0.24 |
| | | | | | | Total for 1932 | 23.76 | 27.04 | -4.10 | 30.02 | 24.28 | 17.00 |

(3) This account and Table I are based on "Climatological Data, Kansas Section, 2. U. S. Dept. Agri. Weather Bureau. Vol. 45 and 46", by Snowden D. Flora.

wheat and grazing belt.

January, 1932, was colder than this month in the previous two years. The month was characterized by considerable snowfall, cloudy weather, and ample moisture, except in western counties. February was the fourth coldest on record. There was a cold wave on the 2nd and 3rd. Moisture was deficient. March was the sixth coldest on record. There was a heavy snow on the 21st and there were severe dust storms on the 29th. April was milder than usual. There were dust storms in the first part of the month, but good rains late in the month. May was characterized by marked shortage of moisture, much sunshine and abnormally warm weather. June was one of the wettest months ever recorded. July was the fourth hottest July since 1887. The western part of the state was very dry. August had good growing weather, with normal sunshine but a deficiency of moisture. September was about normal as to temperature, but drought prevailed in most parts of the state, being most marked in the western half of the state. October was the driest for eleven years. It was also colder than usual. The first killing frost occurred on October 5th over the western third and on the 11th over most of the remainder of the state. November was one of the driest on record and, in the eastern part of the state, one of the coldest months. Moisture was deficient for the fifth successive month. The weather in December was colder than any month in nearly two years. Rainfall was deficient, especially in the western third.

### Source of Information

The two questionnaires used were very similar to those used last year and recorded in the 1931 report, except for slight changes in the headings. The replies were somewhat more complete and more accurate. A summary map was prepared from the replies, in which both the summary number and the name of the reporter were recorded in the county; thus, 4 Jones (4). The reports showed considerable agreement for the reporters in the various counties, but where there was a wide difference, the rating given by the extension entomologist was accepted as being probably the more accurate.

The reporters were asked to rate the list of insects

(4) Mr. B. L. Shepherd, a graduate student in Entomology, made the summary map.

according to six categories, as was done last year. These categories, as given in the questionnaires, were as follows:

0—Score the insect at 0 when you have neither seen the particular kind of insect nor had any reports of its presence in the county.

1—Score at 1 when you have seen a few individuals or the species has been reported as being scarce.

2—Score at 2 when the species is plentiful but is not doing noticeable damage.

3—The species is abundant, some damage has been seen or reported to you.

4—Local outbreaks; the species is doing severe damage in certain fields.

5—The species is in general outbreak. This rating is given only when the insects are doing their most severe damage or are as plentiful as they ever get in your locality.

The persons reporting were placed in three groups:

Group 1—Entomologists of the state, including the staffs at Kansas State College, Kansas University, U. S. Entomological Laboratory at Wichita, and the extension entomologist. Total reports in group—11 in July and 13 in October.

Group 2—County agricultural agents—78 in the state.

65 replied in June and 68 in October.

Group 3—Leading farmers selected and circularized by Mr. Floyd K. Reed and the vocational agricultural teachers. Seventy-two farmers and 19 vocational agricultural teachers replied in July; 37 farmers and three teachers in October.

Grand total of replies—288.

In arriving at a rating for each insect in the various counties, 0 and 1 reports were not included in the addition for deriving the average, because all insects listed may be rated as 1 for every year in every county in the state where its plant or animal host occurs. Such reports were not disregarded, however, but were useful in interpreting other reports. A further discussion of the methods used was given in the report for 1931.

**Summary Report on the Insects of Kansas for 1932**

**The alfalfa caterpillar** was less plentiful than for about three years. Both the larvae and the adults, which are the common green worms and the yellow butterflies of

alfalfa fields, were scarce. Parasitism appeared to be about average.

**Kafir ants** are primarily a pest of southeast Kansas. Areas 1, 2 and 5 were scored almost uniformly at 3. In the following 21 counties, the average of the reports was 3: Cherokee, Crawford, Bourbon, Labette, Neosho, Allen, Anderson, Montgomery, Wilson, Woodson, Coffey, Osage, Cowley, Chase, Dickinson, Sumner, Sedgwick, Ottawa, Rice, Leavenworth, and Brown. In the following five counties, the population was scored at 2: Comanche, McPherson, Saline, Geary and Lyon.

**Aphids and Mealy Bugs.**

Aphids were very scarce during 1932. The hot, dry season apparently was unfavorable.

**Green bug (Toxoptera graminum)** was scored at 3 in Washington County and at 2 in Dickinson, Franklin, Montgomery and Cherokee Counties. There was therefore, a small population of this insect in the state during 1932.

**Pea aphids in alfalfa.** For the first time since the initial outbreak in Kansas in 1921, there were no outbreaks reported or observed during April and May. However, Crawford County was scored at 4 by Mr. Roy E. Gwin, the county agent, which would indicate some local outbreaks. Bourbon, Allen, Harvey, Edwards, Hodgeman and Ford Counties were graded at 3, while Meade, McPherson, Sedgwick, Dickinson, Clay, Washington, Riley, Jefferson, Douglas, Wyandotte and Labette were scored at 2. Pea aphids were observed in early May in alfalfa fields of Riley county, but were not plentiful enough to attempt control experiments.

**Corn root louse.** This insect was reported for only 14 counties, all of which were in eastern Kansas. Allen was rated at 4; Brown, Greenwood, Johnson, Wilson and Jewel at 3, and six other counties at 2.

**Mealy bugs.** There were scattered reports of mealy bugs in 1932. Cowley and Wyandotte Counties were scored at 4; Labette, Johnson and Finney were rated at 3; Linn, Neosho, Kiowa and Norton were rated at 2.

**Arbor vitae aphids** which were so plentiful during 1931, were very scarce during the early spring of 1932.

* * * * * * * * * *

**The evergreen bagworm** was scarce during 1932. Harvey and Morris Counties were rated at 4; Brown, Wyandotte, Wabaunsee, Riley, Sedgwick, Coffey, Crawford

and Labette were rated at 3, while eight other scattered counties were scored at 2. Bagworms were observed in damaging numbers on a hedge at the Country Club at Manhattan, and on willow in Doniphan County.

**Bees** produced a good crop of honey in 1932. The weather was favorable for nectar-gathering during the blooming of fruit trees. June had enough interspersed showers and sunshine, according to Dr. R. L. Parker, to be favorable to both plants and bees. There was a good nectar flow from sweet and white clovers in the early summer. This nectar flow was cut short by the hot, dry weather in late July. The bees in the college apiary produced an average surplus of about 75 pounds of extracted honey per colony, as compared with no surplus in the preceding two years.

**Blister beetles,** while plentiful during 1932, were distinctly less destructive than in the previous year. They occurred in all parts of the state and damaged garden crops, especially potatoes and tomatoes. Leavenworth, Johnson, Linn, Bourbon, Chautauqua, Washington, Butler and Saline Counties were scored at 4; 39 counties at 3, and 18 counties at 2. Blister beetles were scarce in Riley County, but they were said to have done more damage to potatoes in Jewell County than was done by the Colorado potato beetle.

**Borers**—chiefly the elm borer and flat-headed apple tree borer—were reported as 4 in Montgomery, Labette, Wyandotte, Doniphan, Lane, Gray and Harvey Counties. Cherokee, Crawford, Bourbon, Johnson, Coffey, Shawnee, Jackson, Wabaunsee, Riley, Washington, Harper, Lincoln, Jewell, Ness, Ford, Meade, Finney, Thomas and Sherman were scored at 3, while ten other counties were rated at 2. Both of these species of borers were plentiful during 1931 and 1932, according to Prof. Geo. A. Dean, due largely to the hot, dry seasons and foliage damage by canker worms. Both species attacked elms severely but the latter species attacked apple, maple, walnut, plum and cherry trees also.

**Bot flies** were reported as prevalent during 1932 in every section of the state except the southwestern counties (Fig. 2.). Four counties reported the population at 4; 36 counties at 3, and 24 at 2.

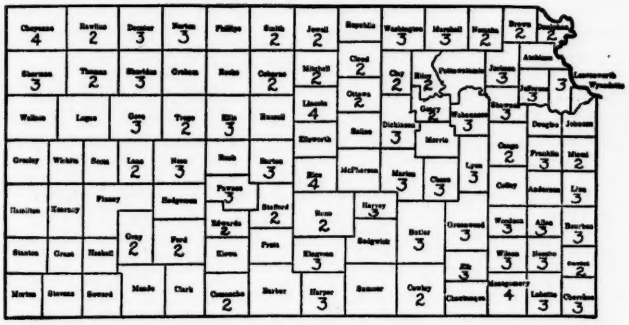

Fig. 2—Bot fly population summary map of Kansas for 1932.

Horse bot larvae were very serious during the early spring. Several horses died from the attacks of the larvae during March and April. The flies made handling of teams difficult in many parts of the state during July and late October. The species attacking horses in Kansas are the common bot and the throat bot. Only one report of the dreaded nosebot was received. It came from Oberlin, Kansas.

**Box elder bugs** were perhaps more plentiful than usual during the summer and fall of 1932. The numbers on the south sides of stone and brick buildings in many counties of central and eastern Kansas in November were the largest observed in recent years.

**Cabbage worms** (chiefly **Pieris rapae** and **Autographa brassicae**) were somewhat more plentiful and destructive in 1932 than usual. Wyandotte, Linn, Neosho, Franklin, Riley, Harvey, Lincoln, Osborne, Smith, Kiowa, and Trego Counties have been scored at 4; 28 widely scattered counties at 3, and 10 counties at 2.

**Canker worms** (Fig. 3) were again plentiful in the eastern half of the state during 1932. Saline County was rated at 5; 18 counties at 4; 25 counties at 3, and seven counties at 2.

Heavy defoliation of apple, elm, hackberry and willow trees was observed May 21 in Pottawatomie County. The trees on the college campus were sprayed May 14, unbanded elms especially being attacked.

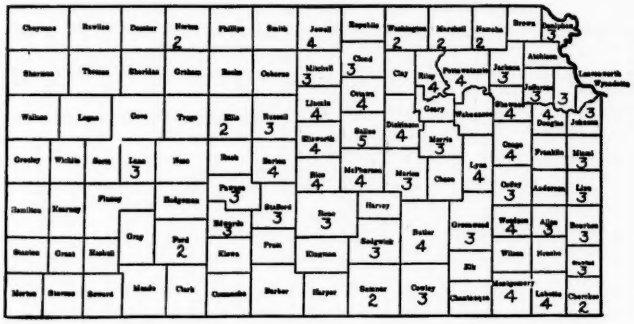

Fig. 3.—Canker worm population summary map of Kansas for 1932.

In Kansas, the canker worms appear in two waves, according to Dr. R. L. Parker, The first wave consists of fall canker worms and attains a peak about February 15, depending on whether the period of warm weather comes earlier or later. The second wave consists of spring canker worms, largely, coming about the middle of March.

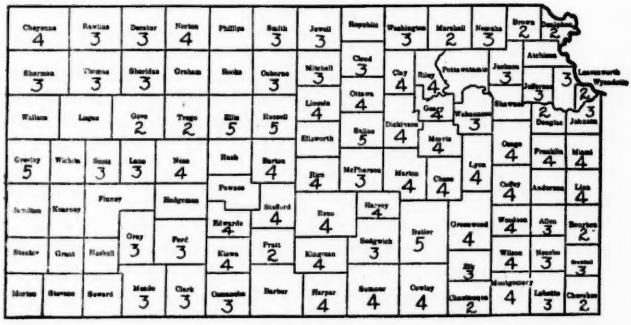

Fig. 4.—Cattle grub population summary map of Kansas for 1932.

**Cattle grubs** (fig. 4) were again very plentiful. The report is especially good because of control campaigns carried on during the year by the extension entomologist. Saline, Russell, Ellis, Butler and Greeley Counties were

scored at 5; 33 counties were scored at 4; 29 counties at 3, and 11 counties at 2.

**Cattle lice** (Fig. 5) were again plentiful in the state. The following counties were scored at 4: Montgomery, Chase, Butler, Ottawa, Rice, Kingman, Russell and Norton. Twenty-six scattered counties were rated at 3, and 21 counties at 2. Cattle lice were most numerous in farming areas 1, 5, 6, 7, 9 and 11.

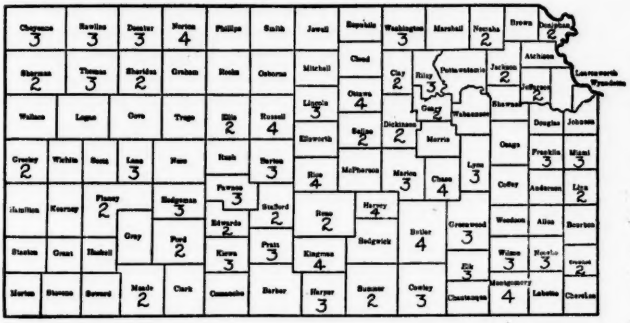

Fig. 5.—Cattle lice population summary map of Kansas for 1932.

**Chinch bugs** (Fig. 6) were almost absent in 1931, but appeared suddenly in numbers during the summer of 1932. Apparently very few bugs came out of hibernation, but they built up their numbers rapidly during late spring. They damaged chiefly corn, barley, wheat, and Sudan

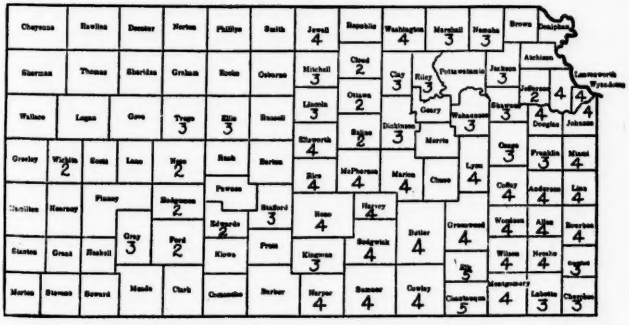

Fig. 6.—Chinch bug population summary map for Kansas, 1932.

grass in the eastern half of the state. They were particularly bad in the eastern and southeastern counties. Elk and Chautauqua Counties which are non-farm bureau counties, were scored at 5; 29 counties at 4; 20 counties at 3, and nine counties at 2.

Barriers were run at the college farm for the first time since 1927. Several hundred barriers were built in the state, according to the extension entomologist, in counties as far west as Harper, Reno and Rice.

The second generation of bugs was a large one, and large numbers went into hibernation in the fall and early winter, particularly in central Kansas. They were aided by the very dry weather. Fall burning was extensively carried out by farmers in about 15 southeastern and southcentral counties. These counties were Rice, Reno, Kingman, Harper, Sumner, Sedgwick, Harvey, Butler, Chase, Greenwood, Wilson, Woodson, Coffey, Lyon and Montgomery.

**The codling moth** was particularly abundant in 1932 in areas 1, 2, 3, 4, 5 and 6, which constitute the apple district of Kansas. This insect was more destructive and abundant than at any time since 1926. This is attributed to (1) the mild winter and failure to destroy culls in the fall of 1931; (2) the short apple crop, and (3) hail and rains which made it impossible to retain proper coverage with sprays.

Allen, Harvey, Sumner, Trego, Finney and Meade Counties were scored at 5; Neosho, Wilson, Clay, Cowley, Sedgwick, and Harper Counties at 4, 12 counties at 3, and nine at 2.

The apple crop in northeast Kansas was about 10 per cent of the 1931 crop. Because of this light crop and the low price for apples, many growers sprayed only twice, whereas normally they made five to eight sprays. As many as 200 worms were found under one band. The situation was perfect for heavy codling moth injury, with the heavy population concentrated on a greatly reduced apple crop. Four different hail storms damaged the apples also, and many larvae entered at the broken skin of the young apples.

**Corn bill bugs** were plentiful only in areas 1, 2, 5 and 6. Wilson, Montgomery and Comanche were rated at 4; Cherokee, Labette, Neosho, Woodson, Allen, Cowley, Sumner, Sedgwick, Marion, Greenwood and Morris Counties were rated at 3. Eight other counties were scored at 2.

**The corn earworm** was again plentiful and destructive in the state (fig. 7). Its occurrence was state wide. Only Saline County was rated at 5, but 20 counties were scored at 4; 34 counties at 3, and 17 counties at 2.

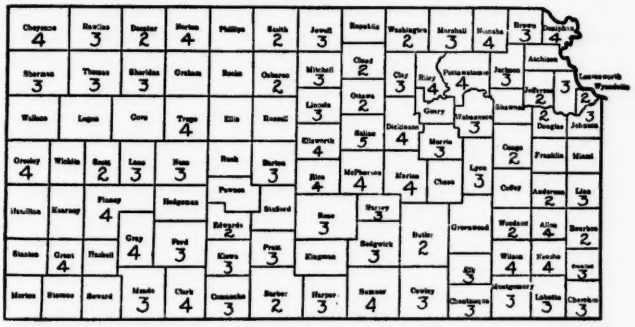

Fig. 7.—Corn earworm population summary map of Kansas, 1932.

The first generation of worms was somewhat smaller than occurred last year and only about the normal amount of "rag worm" injury occurred. The second and third generations built up rapidly and late planted corn was 100 percent infested and severely damaged.

In October, many reports of earworms damaging sorghum heads came in from Riley, Ellsworth, Rice, Reno, Harper and Labette Counties. Heads were said to have one to 12 larvae per head, and immature seed was extensively destroyed.

**The corn rootworms** which were very abundant and destructive in 1931 were much less plentiful during 1932 and very little damage was done. It is believed that the extreme dryness of the soil was unfavorable. These insects eat the roots from the corn plants or seriously injure them by "barking" them, so that the stalks fall over after August rains. Rotation is an effective control.

**The corn stalk borer (Papaipema nebris)** was not as plentiful in 1932 as in the two previous years. Rice, Stafford, Smith Ness, Sheridan and Thomas Counties were scored at 4: Atchison, Harvey, Barton, Norton, Rawlins, and Sherman Counties at 3, and 19 counties, all in the eastern half of Kansas were scored at 2.

**Cotton worm moths** were much less plentiful than usual in their fall flight during 1932. They were reported

only in Shawnee, Riley, Dickinson, Thomas and Montgomery Counties. The latter county was rated at 3, the others at 1. No fruit injury was seen nor reported.

**The southwestern corn borer (Diatraea grandiosella** Dyar) has been reported by Mr. J. R. Horton as occurring in Morton and Stevens Counties in the extreme southwestern corner of Kansas. It was first discovered in Kansas in 1931, but it was known to occur in the panhandle of Oklahoma for some years previous. While only about one per cent of the stalks were infested in 1931, it is not known whether the species is slowly spreading northward or whether this native Mexican species has for the time being reached its northern limits. Mr. J. R, Horton reported, after making a survey during the fall of 1932, that this borer extended its territory only in Morton County where it was found about seven miles northwest of Richfield. It was not found north or east of the 1931 limits of infestation in Stevens County, largely because of lack of corn.

**Curculios**

**Clover leaf weevils** were scarce this year. Only one report of damage was received, which was from Franklin County. The cocoons in Riley County showed heavier parasitism than usual.

**Clover root curculios** were plentiful only during the late spring, and largely disappeared for the rest of the season.

**Plum curculios** did very heavy damage to apples and cherries in Doniphan and Riley Counties. Both crops were small and a heavy curculio population concentrated on them. The mild, dry winter was very favorable to them.

**The apple curculio** was very injurious in Doniphan County in 1932. One large orchard of Jonathan and Ben Davis apples was a total loss from curculio damage (Plate 1, fig. 6). A large curculio population concentrated on the small apple crop with ruinous results. Mr. P. G. Lamerson has prepared a report on this insect on this season's observations. The damage in Doniphan County is estimated to have been 10 to 50 per cent. The heavy concentration in 1932 was due to the mild winter of 1931-'32, the short apple crop and the ineffectiveness of control measures.

**The cabbage curculio** was reported doing damage at Lynden, Kansas, May 4. Several local reports of damage were also received. The insect was therefore,

more plentiful than in recent years.

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**Cutworms** were included only in the July report and the reports, therefore, refer to the species occurring before that month. Cutworms were plentiful and statewide in occurrence, but less injurious than during the previous year. Gove County was scored at 5 by H. D. Cope. Wyandotte, Geary, Morris, Dickinson, McPherson, Sumner, Reno, Mitchell, Grant, Sheridan, Thomas and Sherman Counties were scored at 4; 39 counties at 3, and 29 counties at 2.

Variegated cutworms were fairly plentiful in Riley County, but no damage was done and control measures were unnecessary. There was a little damage by **Ch. agrestis** in areas 6 and 7, according to the extension entomologist.

**The eight spotted forester moth,** in early May, did greater foliage damage than usual to grapes in Sedgwick and Riley Counties. The larvae make a nest by rolling the leaves, and eat the foliage from the inside of the case.

**The fall army worm** did not appear in outbreaks in Kansas during 1932. In fact, these insects were less plentiful than usual. Only eight counties indicated their presence, while C. E. Dunbar reported them at 4 for Sheridan County.

**False wireworms** did less damage than in 1931, since much wheat in western Kansas was not sown because of the extremely dry fall. The greatest population occurred in areas 6, 9, 10 and 11. Sheridan, Ellsworth and Rice Counties were graded at 4, Meade, Ford, Kiowa, Finney, Pawnee, Ness, Thomas, and Rawlins in western Kansas, and Riley, Wyandotte, Clark, and Montgomery in eastern Kansas, were rated at 3, while 19 widely scattered counties were rated at 2. Adult beetles were very plentiful in Riley County during September and October.

**Fleas** were perhaps somewhat less troublesome in houses and on pets during 1932. The summary of the questionnaire shows only Saline, Marion, Doniphan and Wyandotte Counties rated at 4; 10 counties at 3, and 18 widely scattered ones at 2. A cool, moist season is apparently more favorable than a hot, dry one.

**Biting flies on livestock** occurred in a widespread outbreak during the early summer of 1932 (Fig. 8). The summary map shows three western counties rated at

5; 441 counties at 4; 41 counties at 3, and five counties at 2. This summary probably gives a too conservative indication of the heavy population of biting flies which occurred, since the correspondence dealing particularly with repellant fly sprays was the heaviest in recent years. Requests began to arrive in May, before flies were observed in numbers. The horn fly began to predominate about the middle of July.

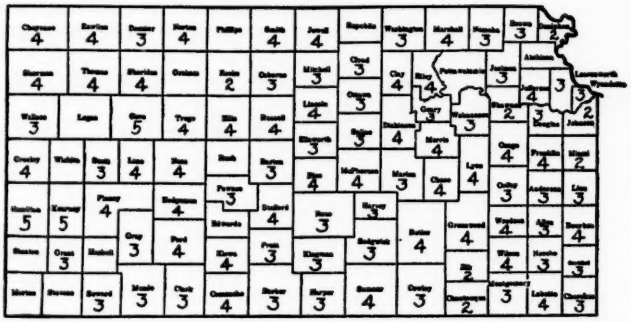

Fig. 8.—Biting flies of live stock population summary map of Kansas for 1932.

**Grasshoppers** were much less plentiful during 1932 than during the previous year (Fig. 9.). Local damage was done but there was little defoliation which would be characterized as serious. These insects were most numerous in eastern Kansas. For the state, grasshoppers

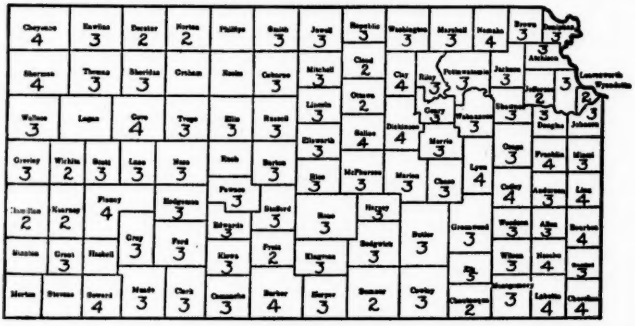

Fig. 9.—Grasshopper population summary map of Kansas for 1932.

were somewhat less plentiful than average.

The grasshopper population consisted largely of the differential, two lined, and red legged. The latter species greatly outnumbered the lesser migratory species in Riley County during the summer. Some injury to alfalfa flowers was observed in Riley County on July 7, and to the alfalfa seed crop in Barton and Pawnee Counties in July and August. By July 30 the hoppers had eaten the lower leaves of corn rather badly in several eastern and southeastern counties. The parasitic flies, **Sarcophaga kelleyi** were unusually plentiful in Kansas during 1932, and constituted the most important natural control factor. These flies were particularly plentiful during August and early September. Some grasshoppers were killed by the fungus disease in July in northeastern Kansas, but it was not a strong control factor (Plate 1, fig. 5). Artificial dissemination of diseased hoppers in South Dakota resulted in considerable newspaper publicity, and many requests for the disease were received by the Kansas Agricultural Experiment Station from Kansas farmers. This plan of control proved unsuccessful, as previous attempts elsewhere have been. **The green striped maple worm** appeared in outbreak form in eastern Kansas during 1932 (Plate 1, figs. 2 and 7). This was the first time this insect has appeared in destructive numbers in Riley County since 1888. The maple trees at the agronomy farm and, to a lesser extent, on the college campus were 30 per cent defoliated by the first generation of larvae in July. Maple trees in Doniphan County (Denton, Kansas) were defoliated by the second generation in September, while there was practically no damage by that generation in Riley County. Riley and Doniphan Counties were rated at 4; Johnson County at 3, and Cherokee County at 2.

**The harlequin cabbage bug,** for the first time in recent years, appeared in destructive numbers in various parts of the state during 1932. Damage resulted primarily to cabbage, horseradish and cauliflower in the eastern third of the state and in area No. 10. Johnson, Wyandotte, Reno, Sedgwick and Cheyenne Counties were scored at 4; Leavenworth, Woodson, Coffey, Montgomery, Linn, Lyon, Clay, Dickinson, Marion, Harvey, Kiowa, Trego, Ness, Ford and Clark Counties were scored at 3, while 14 eastern and central counties were rated at 2.

**The Hessian fly** did considerable damage to wheat during 1932 in eastern and central Kansas (Fig. 10). Eigh-

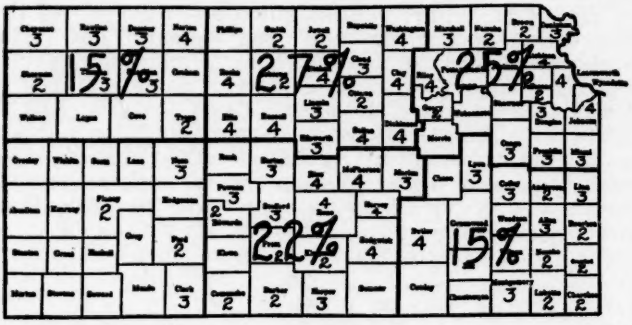

Fig. 10.—Hessian fly population summary map of Kansas for 1932. Per cents are from the summer survey by Walkden, Jones and Horton.

teen counties were rated at 4; 27 counties at 3, and 23 counties at 2. This insect normally infests wheat in all counties in Kansas, except the extreme southwestern counties (Pl. 1, fig. 4).

A survey made during the early summer of 1932 by Messrs. Horton, Walkden and Jones of the U. S. Laboratory at Wichita, showed that the fly was most destructive in the northern half of the state, there being an average of 25-27 per cent of straws infested. The infestation and damage was worst near the Nebraska line. In south-central Kansas, the infestation was bad from McPherson, Saline, Russell, and Barton to Sumner County, inclusive, according to the extension entomologist.

**Horse flies or Tabanids** were perhaps less plentiful than usual because of the extreme dryness of the season. Finney County was scored at 4; Neosho, Wyandotte, Leavenworth, Wabaunsee, Dickinson, Greenwood, McPherson, Mitchell, Osborne, Smith, Trego, Ness, Sheridan, Decatur and Rawlins Counties were scored at 3, while 37 other counties were scored at 2.

**Leafhoppers on potatoes,** alfalfa, apple and other crops were probably unchanged in status durng 1932. They were rated at 4 in Johnson and Clark Counties; at 3 in Wyandotte, Leavenworth, Doniphan, Jefferson, Douglas, Montgomery, Lyon, Elk, Riley, Clay, McPherson, Harvey, Sedgwick, Jewell, Lincoln, Rice, Reno, Lane and Finney Counties, and at 2 in 20 other scattered counties.

### Mites

**Mange mites on cattle** were more plentiful and on the increase during 1932. Montgomery, Pawnee, Russell and Comanche Counties were rated at 3; Bourbon, Cowley, Clay, Trego, Ness and Rawlins Counties were rated at 2.

**Mange mites on hogs** were both plentiful and troublesome during 1932. Forty-six counties reported their presence. Norton and Washington Counties were rated at 5; Sheridan at 4; Rawlins, Thomas, Lane, Kiowa, Comanche, Dickinson, Wabaunsee, Brown, Doniphan, Johnson, Neosho, Montgomery and Labette at 3, and eight other counties at 2.

**The sheep scab mite** was less plentiful during 1932 than in 1931. There were 720 flocks treated in 1931, and only 377 in 1932.

**Mites on wheat** were reported chiefly from southern Kansas and on arborvitae from northeastern Kansas. Doniphan and Leavenworth counties were ranked at 4; Labette, Sedgwick, Reno, Comanche, Edwards, Ford, Clark, Meade, Gray, Grant, Finney and Thomas Counties at 3, and three other counties at 2. These mites caused relatively little trouble in 1932, and were less plentiful than in 1931.

* * * * * * * * * * *

**The oriental fruit moth** was discovered in Kansas for the first time by Dr. H. B. Hungerford and B. E. Liston. As a result of a special survey, this pest was found in 13 counties; viz., Shawnee, Johnson, Franklin, Coffey, Anderson, Allen, Bourbon, Wilson, Neosho, Crawford, Montgomery, Labette and Cherokee. This insect was known to be present in western Missouri for several years. The early generation of larvae bore into the young twigs, especially of peach, similar to the peach twig borer, while the later generations enter the fruit.

**Pentatomid (Chlorochroa ligatus** Say). Prof. J. W. Zahnley discovered this insect damaging soy beans at the college farm Sept. 28 (Pl. 1, figs. 3 and 11), The nymphs and adults fed upon the young pods, causing them to split open when mature. This was the first report of this insect in recent years.

**Rose slugs** were particularly severe in Riley, Russell, Barton, Clay, Rawlins and Cheyenne Counties. The writers never saw so many adults ovipositing on rose foliage, nor such severe foliage damage as occurred in

early May.

**Scale insects** were graded at 3 in Leavenworth, Johnson, Crawford, Labette, Neosho, Montgomery, Riley, Sedgwick, Harper, Ford, Meade and Norton Counties, and at 2 in 11 other counties. These insects probably were unchanged in status over 1931.

**Seed corn maggots** were reported for ten counties. Sedgwick was scord at 3; Shawnee, Riley, Marion, Lincoln, Edwards, Norton, Sheridan, Rawlins, and Cheyenne at 2. They were not as troublesome as usual in Riley County.

**Sod webworms (Crambus** spp.) were reported for ten counties. Geary was rated at 5, Bourbon, Montgomery, Marion, Barton, Edwards, and Hodgman at 2, and Riley, Jefferson and Osage at 2.

**Stored grain insects** took a heavy toll of wheat and corn during 1932. The situation was intensified by the low prices for grain, such that farmers held it in the hope of better prices. There was a large carryover of corn and wheat in 1932. At the college farm, the Indian meal moth was more troublesome than usual. Larvae mined in the wood of the granaries. The Angoumois grain moth was also plentiful throughout the state, judging by correspondence and other reports. The cadelle was likewise very abundant. Somewhat less fumigating of flour mills was done in 1932, largely because of financial reasons.

**The strawberry leaf roller** was reported from 39 counties. Doniphan, Leavenworth, Douglas, Shawnee and Harvey Counties were rated at 4: Jefferson, Osage, Crawford, Wabaunsee, Marshall, McPherson, Ottawa and Stafford Counties at 3, and six other counties at 2. Damage was confined largely to Doniphan, Leavenworth, Shawnee and Douglas Counties.

**Tent caterpillars** were more numerous in Kansas during 1932 than in the previous year. Labette was scored at 4; Leavenworth, Jefferson, Cherokee, Montgomery, Morris, Harvey, Jewell, Stafford and Comanche Counties at 3, and 37 other scattered counties at 2. A mulberry tree near the college campus had eight webs in it on August 25.

**Tomato worms** were less plentiful during 1932, though widely distributed and damaging in communities. Dickinson and Marshall Counties were scored at 4; Johnson, Linn, Bourbon, Labette, Montgomery, Wilson, Neosho, Allen, Franklin, Shawnee, Jackson, Washing-

ton, Clay, Jewell and Ford Counties were scored at 3, and 41 other counties were scored at 2.

**Termites** were again widely reported. Labette, Morris, McPherson, Rice, Norton and Ness Counties were rated at 4; Bourbon, Linn Johnson, Leavenworth, Doniphan, Neosho, Montgomery, Lyon, Geary, Riley, Clay, Dickinson, Cowley, Sumner, Harper, Mitchell, Cloud, Jewell, Smith, Barton, Pratt, Clark and Cheyenne at 3, and 21 other counties at 2.

It was discovered that many local carpenters and contractors have learned the essentials of termite control, and that at least four new houses built in Manhattan during 1932 included a termite shield and other anti-termite features. The extension entomologist, in his annual report, stated that 118 carpenters and builders in Kansas were known to have adopted termite control practices; that 721 buildings in the state had been reported because of termite damage, and that 93 termite proof buildings had been constructed.

**Walnut worms (Datana integerrima)** were again very destructive. Many trees wre defoliated by the large brood of the first generation in June, but the second generation was a very small one (Fig. 11). The defoliation in the eastern half of the state by the first generation was severe (Pl. 1, fig. 9). The first generation was heavily parasitized. Other species of Datana, on apple and sumac were less plentiful than during 1931.

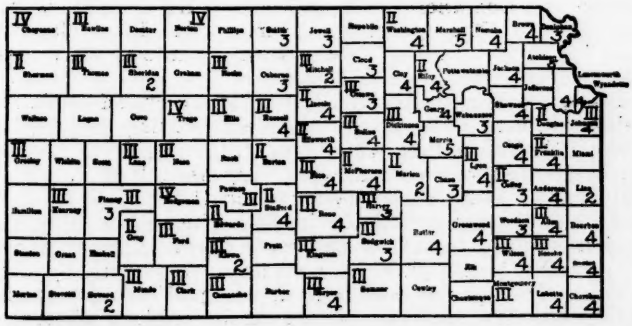

Fig. 11.—Summary map of Kansas showing the population of walnut worms (1, 2, 3, 4, 5); and of wheat straw worms (I, II, III, IV, V).

**Wheat straw worms** (Fig. 11) were plentiful during 1933, though very little damage was done. They were reported for 67 counties. Trego, Hodgeman and Cheyenne Counties were scored at 4; 30 counties at 3, and 14 counties at 2.

This insect was particularly plentiful in divisions 6, 9 and 10, partly because of poor seed bed preparation. The first brood was relatively small, but the second was said by the extension entomologist to have been very large.

**White grubs** were perhaps a little less plentiful and destructive during 1932, but they were reported for nearly every county in the state. In 27 counties they were rated at 3, and at 2 in 40 other counties. White grubs were worst in areas 1, 2, 6 and 9.

A large number of May beetle adults were spaded up in gardens during early May. The beetles later came to trap lights in quantities. A large brood reached maturity in 1932, according to Professor Bryson. Damage from the grubs may then be expected to occur in 1933 and 1934. As many as 15 grubs to the square foot were found in grassland in Riley County on Sept. 21.

### Webworms

**The garden webworm** was less plentiful than during 1931. There was slight local damage to alfalfa and gardens in southeastern Kansas. Cherokee, Labette, Neosho, Wilson, Coffey, Johnson, Cheyenne and Finney Counties were rated at 4: Crawford, Montgomery, Wyandotte, Cowley, Dickinson, Sedgwick, Pawnee, Norton and Comanche at 3, while 12 other counties were scored at 2. This insect was scarcer in Riley County than for three or four years. Even the adults were less plentiful at lights than is common.

**Loxostege commixtalis** Walk., The so-called alfalfa webworm, was exceedingly abundant during 1932 (Pl. 1, fig. 10). The moths, which resemble closely the adults of the garden webworms, were very abundant in April and May in grass plots, pastures, on the golf links and to a lesser extent in alfalfa fields. The moths flew up in clouds when disturbed and were taken in great numbers at the trap lights. No damage was done by the larvae. The species was reared, using alfalfa for food. This is the first time, according to the writers' observations, that this species was so abundant ,though Prof. D. A. Wilbur said they were also plentiful during 1931. The species is of economic importance in Colorado,

where it has been studied as an alfalfa pest. This flight of moths was general in the great plains area.

Damage to 40 acres of "June grass" at Great Bend during April and May was determined to be due to **Nomophila noctuella** (Plate 1, fig. 1), though some larvae of **L. commixtalis** may have been present also. Franklin gulls ate many of the caterpillars following harrowing.

**Beet webworms** (Plate 1, fig. 7), a closely related form, occurred in outbreak form in Gove and Cheyenne Counties. Mr. H. J. Stewart, the County Agent at St. Francis, reported the moths as being abundant August 10, and that the larvae not only damaged alfalfa in small areas, causing premature mowing, but also fed upon the silks of corn. The worms defoliated some trees and damaged some gardens. This was the first outbreak of this insect in recent years in Kansas, but small numbers have been taken in former years on alfalfa and Russian thistle. A few larvae occurred in Riley County. Many moths were taken at trap lights. The species was unusually abundant in other states. The moths were reported as numerous in Grant County, Sept. 9, in kafir fields.

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**Wireworms** were perhaps less plentiful and destructive during 1932 than in the previous year. Rice County was scored at 5; Jefferson, Jackson, Hodgeman, Lane, and Finney Counties were scored at 4; 19 other counties were rated at 3, and 20 others at 2.

## SUMMARY AND CONCLUSIONS

The year 1932 was the driest in 15 years, the rainfall deficiency varying in parts of the state from one to eight inches. This deficiency was 7.2 inches for Riley County. This was the second of a series of very dry years. The winter of 1931-1932 was an exceptionally mild one. The spring was early and the first half was characterized by about a normal rainfall. Late freezes killed peaches, reduced the apple crop to one-fourth, and delayed vegetation in general. The late spring and early summer, while with less than normal rainfall, provided fairly good growing conditions for crops. The summer was characterized by extreme temperatures and marked moisture deficiency. There were excellent yields of potatoes, a good yield of corn and melons, fair to good crops of wheat, sorghums and alfalfa, and

poor crops of fruits. The fall was characterized by marked deficiency in rainfall. In many counties, not over 25 per cent of the wheat acreage was planted. Cold weather began early and both October and November were colder than normal.

The year 1932 was characterized by outbreaks of chinch bugs, biting flies on cattle, the green striped maple worm, walnut caterpillars, the so-called alfalfa webworm **(Loxostege commixtalis)** and beet webworms in alfalfa.

The following insects were **more** plentiful than during 1931; kafir ants, blister beetles, bot flies, cattle grubs, cabbage worms, codling moth, chinch bugs, Hessian fly, harlequin cabbage bug, wheat straw worms, tent caterpillars, strawberry leaf roller and the mange mites on hogs.

The following insects were **less** plentiful than during 1931; Mealy bugs, plant lice, bag worms, corn bill bugs, fleas, grasshoppers, stalk borers, wireworms, white grubs, tomato worms, plant lice and horse flies. False wireworms were very numerous, but their injury was less than in 1931 because much wheat was not planted where wireworms were most abundant.

The year was further characterized by the relative or comparative absence of the following insects: Greenbug, pea aphids, cotton worm moths, fall army worms and garden webworms.

The following insects probably were **unchanged** in status: Tree borers, spring and fall canker worms, cattle lice, cutworms, corn stalk borers, corn earworm, termites, seed corn maggots, leaf hoppers, and stored grain insects.

For the year as a whole, there was less insect damage than usual. While the public is inclined to believe that insects are more plentiful and destructive following mild winters, frequently, as in 1932, the opposite is the case.

## PLATE I

The more striking features of insect damage in Kansas during 1932. All the photographs, except 1, 4, 8 and 11 were made by Mr. Floyd Hanna, the official college photographer, who also made up the plate.

1. Severe damage to a 40-acre field of grass by

**Nomophila noctuella** at Great Bend, Kansas. Photo by Mr. Sherman Hoar.

2. Green striped maple worms on maple branch.
3. Nymph and adult of soldier bug **(Chlorochroa ligatus)** which damaged soy beans on the college farm in September, 1932.
4. Wheat near McFarland, Kansas, severely damaged by Hessian fly.
5. Grasshoppers killed by the grasshopper fungus, **Empusa grylli,** clinging to tops of weeds on Hunter's Island, Riley County, in September.
6. An apple from Wathena, Kansas, showing severe feeding damage by the apple curculio, with an adjacent apple "mummy" in which a curculio was reared. Photograph used by courtesy of Dr. R. L. Parker.
7. A beet webworm which occurred in outbreak form in alfalfa fields in northwestern Kansas.
8. Maple trees defoliated by the second generation of green striped maple worms, Denton, Kansas. Photograph by senior author.
9. Severe defoliation of walnut trees by the first generation of the walnut Datana near the agronomy farm at Manhattan.
10. The so-called alfalfa webworm **(Loxostege commixtalis),** the moths of which were exceedingly abundant during the year.
11. Soy beans at the college farm which served as the host for a soldier bug **(Chlorochroa ligatus),** Photograph by senior author.

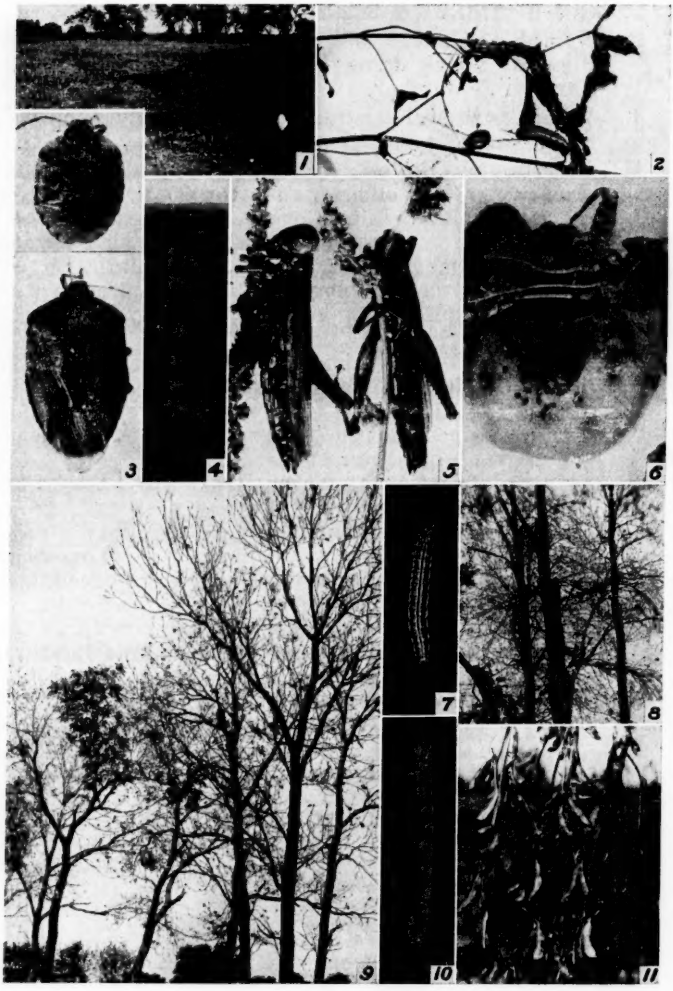


PLATE I

# LIFE HISTORY OF THE LESSER GRAIN BORER

H. H. SCHWARDT, University of Arkansas. 1

The lesser grain borer, **Rhizopertha dominica** Fabr.2, a pest of stored products, is becoming increasingly important in the United States. In Arkansas it is primarily a pest of stored corn and rice, the two most valuable grain crops produced in the state. The duration of the various life stages, together with notes on habits, are given in this paper.

The lesser grain borer probably is a native of India, although Fabricius described it from material taken in South America. It is most often mentioned in entomological literature from India and Australia, where the species has been most abundant. During the Great War it was brought to the United States in numbers in wheat from Australia. Although it was a pest before that time, the numbers added then appear to have given the insect a new footing which it has since retained and enlarged. Neither LeConte (8) nor Blatchley (3) mention this species, which supports the theory that it is a pest of comparatively recent introduction.

Previous investigators have reported fully upon the damage caused by the lesser grain borer, but little has been published concerning its biology. Chittenden (4) described the stages, gave historical information, and the distribution of the pest in North America, which then included eastern and central United States and the coast cities of Mexico and Central America. Tucker (9) considered **R. dominica** to be the most important pest of rough rice in Louisiana in 1912. Doan (6) reported the introduction of the beetles in Australian wheat in 1919, and observed that they were "always quite abundant" in this imported grain and "apparently very destructive". Dendy and Elkington (5) of the British Grain Pests (War) Commission reported that in grain inspected by the Commission the most destructive insects were the lesser grain borer, the rice weevil, and the granary weevil. During investigations which followed, they found that **R. dominica** was more susceptible to cold than either of the two associated pests. Froggatt (7) refers to **R. dominica** as a serious pest of stored wheat

1 Research Paper No. 284, Journal Series, University of Arkansas.

2 Order Coleoptera, Family Bostrichidae.

which has been established in Australia for many years and is most common in New South Wales. Back and Cotton (1), using HCN, successfully fumigated sacked chick peas infested with **R. dominica.** Barnes and Grove (2), working in India, have contributed the most important biological information on this pest, and their paper contains excellent color plates, illustrating all stages in the life history. They found the insect most active from May until August. During this period the time from hatching of the egg to emergence of the adult varied from 24 to 35 days. During the period from October to April this part of the cycle required 183 days. These investigators also determined that individual female beetles may deposit as many as 586 eggs, and that 300 to 400 eggs are commonly produced by a single female.

The investigations reported upon in this paper were conducted at Fayetteville, Arkansas, during the period 1928-1932.

Eggs of the lesser grain borer were most easily obtained by confining numbers of adult beetles in jars with pieces of Yeast Foam. At first eggs were fastened to the surface of this material, but after the beetles had tunneled into the food eggs were glued to the walls of the tunnels, either singly or in groups of from two to seven. They are most frequently placed in groups. Occasionally eggs were fastened to the walls of the jars. The eggs are cylindrical, taper slightly at each extremity, and are provided at one end with a short protuberance about one-third the diameter of the egg. The eggs measure .5 to .6 millimeters in length, and their greatest diameter is .2 to .25 millimeters. They are white in color with a rough opaque surface, parts of which sometimes scale off, revealing the shining white chorion. The eggs are quite fragile and are difficult to remove from the surface to which they are fastened without being broken. They are frequently broken by the beetles during or soon after deposition.

The duration of the incubation period for eggs of **R. dominica** varies, according to seasonal temperatures and other factors, from 5 to 21 days (Table I). The lack of uniformity in the incubation period for different eggs kept under identical conditions of temperature and moisture suggests that incubation sometimes begins before the eggs are deposited.

TABLE I. **Rhizopertha dominica** Fabr. Fayetteville, Ark., 1930-1931. Duration of the incubation period.

| Date of oviposition | Date eggs hatched | Incubation period (days) | Number of eggs |
|---|---|---|---|
| Aug. 29 | Sept. 5 | 7 | 6 |
| Aug. 30 | Sept. 6 | 7 | 3 |
| Aug. 31 | Sept. 5 | 5 | 3 |
| Sept. 1 | Sept. 7 | 6 | 4 |
| Oct. 14 | Oct. 23 | 9 | 12 |
| Feb. 13 | Feb. 25 | 12 | 1 |
| Feb. 13 | Feb. 26 | 13 | 5 |
| Feb. 13 | Feb. 27 | 14 | 1 |
| Feb. 13 | Mar. 1 | 17 | 1 |
| Feb. 13 | Mar. 5 | 21 | 3 |
| Feb. 14 | Feb. 25 | 11 | 5 |

The larvae are white with dark brown heads. When newly hatched, and for a short time thereafter, they are of the same thickness at any part of their length. During this period the larvae are quite active and tunnel into the kernels of grain, entering through abrasions made by the adult beetles. As development progresses inside the grain, the thoracic segments enlarge and the body becomes semicircular, much after the fashion of lamellicorn larvae. Having assumed this form, the larvae move about only enough to feed and extend their tunnels into the grain.

Each individual from one group of newly hatched larvae was placed in a depression made with a needle in a grain of corn. The larvae immediately extended these depressions into tunnels, the progress of which was observed each day by dissecting the kernel just far enough so that the larva could be seen. A second group of larvae were placed individually on small pieces of Yeast Foam. The roughness of this material enabled the larvae to make their entrances unassisted. After from two to four weeks, depending on the season, the pieces of Yeast Foam were broken open and the nearly full grown larvae were placed in ground Yeast Foam, so that the date of pupation could be observed. Newly hatched larvae placed in finely divided foods did not

survive. Duration of the larval period at different seasons and in two foods is shown in Table II. All the larvae reared in Yeast Foam were kept in an incubator which held the temperature at 84 degrees to 86 degrees F. In spite of this artificially maintained temperature, larvae hatched in September attained maturity in less time than was required by those hatching in March.

TABLE II. **Rhizopertha dominica** Fabr. Fayetteville, Ark., 1930-1932. Duration of the larval period.

| Date hatched | Date of pupation | Larval period (days) | Food |
|---|---|---|---|
| Jan. 8 | Feb. 9 | 32 | Whole corn |
| Jan. 8 | Feb. 16 | 39 | Whole corn |
| Jan. 17 | Feb. 22 | 36 | Whole corn |
| Jan. 10 | Mar. 2 | 51 | Whole corn |
| Sept. 6 | Sept. 24 | 18 | Yeast Foam |
| Sept. 6 | Oct. 2 | 26 | Yeast Foam |
| Sept. 7 | Sept. 26 | 19 | Yeast Foam |
| Sept. 7 | Sept. 26 | 19 | Yeast Foam |
| Sept. 7 | Sept. 28 | 21 | Yeast Foam |
| Sept. 7 | Oct. 7 | 30 | Yeast Foam |
| Sept. 8 | Sept. 29 | 21 | Yeast Foam |
| Sept. 10 | Sept. 27 | 17 | Yeast Foam |
| Sept. 2 | Sept. 28 | 26 | Yeast Foam |
| Mar. 14 | April 21 | 38 | Yeast Foam |
| Mar. 21 | April 22 | 32 | Yeast Foam |
| Mar. 24 | April 23 | 30 | Yeast Foam |
| Mar. 24 | April 26 | 33 | Yeast Foam |
| Mar. 29 | May 4 | 36 | Yeast Foam |
| Mar. 29 | May 7 | 39 | Yeast Foam |
| Mar. 29 | May 4 | 36 | Yeast Foam |
| Mar. 29 | May 9 | 41 | Yeast Foam |

The pupal period is spent in a cell which is an enlargement of the end of the larval tunnel. The cell is not lined, and is not required for successful completion of the pupal stage. Pupae taken from the cells will, if

handled carefully, produce normal adults. To obtain the duration of the pupal period, full grown larvae taken from infested foods were placed in small cell-shaped depressions in Yeast Foam and covered with glass slides. Larvae so treated pupated, and spent the pupal stage under conditions closely approaching the natural, and could be observed daily. Of 31 pupae thus observed, 23 required six days for the pupal period, four required five days, and four seven days.

After emergence, the callow beetles remain in the pupal cell three to five days before beginning to feed and tunnel out of the grain. Each of two lots of newly emerged beetles on which observations were made fed for fifteen days before any eggs were deposited.

The beetles are somewhat sluggish and move in an awkward, jerky manner when disturbed. They use their wings, but usually fly aimlessly without progressing many feet from the starting point. However, they may be carried by air currents or caught and carried by moving objects while thus suspended.

The life history of **R. dominica** closely parallels that of the rice weevil, **Sitophilus oryzae** (L.), and is much like that of the angoumois moth, **Sitotroga cerealella** Oliv. The rice weevil deposits its eggs in cavities which it makes in the grain, and the angoumois moth glues them to the outside surface, after which the larvae of either species develop and pupate within the grain.

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## NEW STRATIOMYIDAE IN THE SNOW ENTOMOLOGICAL COLLECTION.

MAURICE T. JAMES, University of Colorado

**Stratiomys beameri,** new species.

Female. Close to **S. Apicula** Loew. This species is readily recognizable by the abdominal markings and by the constriction of the fifth segment. Head and its appendages black; a small spot at the base of the antennae and a distinctly cordate spot just below the ocellar triangle, yellow. Occiput wholly and occipital orbits mainly black; the very narrow inner margins of the occipital orbits and the lower facial orbits yellow. Thorax black; pile straw-yellow, of ordinary density. Scutellum black; spines short, erect, yellow: two apical spots between the spines, and connected on their lower margins, yellow. Abdomen black, with the following yellow markings: a lateral margin on the second, third, and fourth segments, extending inward somewhat at the incisures; a mid-dorsal stripe on the fifth; and a pair of rounded lateral spots on the second, elongated somewhat in the axis of the length of the segment. Incisures prominent; the base of the fifth segment much narrower than the apex of the fourth, the narrowing resulting from an abrupt contraction at the incisure. Venter black; base of first and second segments yellow in the middle; second and third segments with yellow posterior markings, broader in the second; the yellow of the second segment narrowly connected, thus interrupting the broad black band; the second, third, and fourth segments margined laterally, the fifth posteriorly, with yellow. Femora black; tibiae brownish yellow, much contracted at the base, where the color becomes a pale yellow; tarsi yellow. Wings yellowish brown, hyaline. Length, 11 mm.

Type: Female, Cowley County, Kansas, 1916 (R. H. Beamer). 1114 ft.

**Stratiomys media,** new species.

Female. This species closely resembles **S. apicula** Loew, the chief distinctions being the difference in the coloration of the venter and the more reduced dorsal markings of the abdomen. Head black, upper occipital orbits black, lower occipital and facial orbits yellow, occiput black. Front with a yellow subcordate spot below the ocellar triangle. Antennae of the normal **Stratiomys** type, the first segment shining black, the second and third brownish black. Thorax wholly black; scutellum black, the apex and spines yellow; metascutellum black. Head, thorax, and scutellum clothed with fairly dense pile, which is whiter, longer, and more silky than in **S. apicula.** Abdomen black; first segment with a rectangular marking along the lateral margin; second with a large quadrangular marking the width of the segment; third with a broad lateral stripe, extending anteriorly to the width of the marking on the second segment, and extending slightly and very narrowly along the posterior margin; these spots broadly connected. Fourth and fifth segments with lateral margins; fifth with a dorsal line. All these abdominal markings yellow. First, second, and third ventral segments yellow; base of the first black. Fourth and fifth segments black, with yellow lateral and posterior margins. Pile of abdomen uniform, white, moderately long and dense, appressed. Femora, except tips, reddish brown; tips of femora and all of tibiae and tarsi, yellow. Wings hyaline, yellow. Length, 12 mm.

Type: Female, Colorado, July. No additional data.

Paratype: Female, Columbus, Wis., June 23, 1926. In the University of Wisconsin collection.

**Stratiomys vespoides,** new species.

Female. Head noticeably broader than the thorax, brown; the narrow occipital orbits, facial orbits, oral margin, a pair of spots above and another pair below the base of the antennae, all yellow, but all these markings except the occipital orbits imperfectly outlined. Antennae porrect, long; the first segment about seven times the length of the second, very slender at the base, broader at the apex, and ranging in color from pale yellow at the base to brown at the apex; the second segment very short, reddish yellow; the third segment noticeably flattened, strap-like, brown. Eyes bare, pyramidal, the base being the facial orbit, somewhat truncated at the apex. Proboscis brown. Face rough,

not shining. Pile of face and front white; somewhat silvery-tinged on the lower side of the head. Dorsum of thorax black; humeri, posterior angles, and a pair of pre-sutural spots yellow. Pleura largely yellow: mesopleura, however, brown, with wide anterior and posterior margins; the extent of the yellow on the pleura is probably a variable feature, and the patches are not well defined. Sternum brownish-black, with yellow pile. Scutellum yellow; spines yellow, small. Abdomen rounded, the sides of the second and third segments nearly parallel; general color brown, with a yellow lateral margin; all segments but the first with yellow posterior margins, that of the fourth segment somewhat attenuated toward the lateral margins, that of the fifth obsolete. Pile of abdomen brown, short, not silvery. First segment of the venter yellow; remaining segments brown, narrowly margined laterally and posteriorly with yellow, the second segment also with an anterior yellow margin. Pile mostly black, appressed; a large silvery patch in the middle of the second segment. Legs mainly reddish-yellow; base of femora and apex of hind tarsi somewhat darker. Wings hyaline; brownish on the anterior half; the remainder yellow. Length, 10 mm.

Type: Female, "Colo.", July.

No exact locality is given; but this specimen was probably taken in south-eastern Colorado, as the **S. constans** group, to which it very evidently belongs, is known only from southern records. To this group belong **S. constans** Loew and **S. mutabilis** Fabr., from Kansas, Texas, and the Southwest, and several Mexican species. **S. vespoides** is closest to **S. constans** Loew, from which it can easily be separated by the abdominal markings, the lack of silvery pubescence on the abdomen, and the generally brown color.

**Stratiomys rubra,** new species.

These specimens were labeled **S. meigenii** in the Kansas University collection, but I can not see that there is any question as to their distinctness. They differ from **S. meigenii,** along with other minor respects, in that the general body color is brown instead of black; the face is yellow; the abdomen is considerably flattened; and the yellow markings of the second abdominal segment are triangular.

Male. Face yellow, clothed with yellowish pile; ocellar triangle brown; ocelli yellow. Antennae of the

normal **Stratiomys** type; blackish brown. Eyes subcontiguous, black, with a noticeable bronze tinge in certain lights, in the dried specimens, especially in the region of the larger facets. Occipital orbits narrow, brown; occiput chiefly yellowish. Thorax yellowish brown, clothed with moderately long and dense whitish pile; this is thickest on the pleura, and palest in color on the pectus. Scutellum yellow or yellowish brown, brown at the base, yellow pilose; spines yellow, brown at the tips; metascutellum yellowish brown, moderately pilose. The pile of the dorsum, scutellum, and metascutellum rises from black-pigmented pores which are most noticeable on the paler portions of the scutellum and metascutellum, and on the posterior angles of the dorsum. Abdomen flattened, brown, black-pilose, the following marks yellow: a pair of lateral triangles on the second, and posterior interrupted bands on the third and fourth, segments, those of the fourth narrowly connected in the paratype; a lateral margin and triangles at the anterior angles of the second and third segments, and a dorsal line and obsolete posterior margin on the fifth. Venter brown, the segments margined laterally and posteriorly with yellow. Legs yellow; femora brownish. Length, 11 mm.

Type: Male, Atchison County, Kan., July 11, 1924 (E. P. Breakey).

Paratype: Male, Ness County, Kans., July 7, 1912 (F. X. Williams).

**Odontomyia leucogaster,** new species.

Near to **O. aldrichi** Johns., but distinguished by the yellow face, yellow scutellum, more inflated abdomen, the longer and more slanting small cross-vein, and minor features.

Male. Eyes subcontiguous. Vertex black. Face yellow; proboscis black. Face with a small tubercle. First segment of the antennae short, shining, brown; second segment about equal to the first in length yellow; third segment yellow, brown at the apex, with a short style. Occiput black. Dorsum of the thorax black, with appressed whitish tomentum; posterior angles as far as the wing bases, yellow. Pleura and pectus black, pleura narrowly margined with yellow anterior to the wing bases; pteropleura and an anterior spot on the mesopleura largely yellow. Pile whitish, of variable length. Scutellum yellow, grading through yellowish brown to brownish black at the base; spines yellow.

Abdomen wholly yellow except for a biramose black spot along the apex of the first segment, its branches extending toward, but not attaining, the base of this segment, and directed ventrally, and a small adjacent suboval spot at the base of the second segment. Abdomen somewhat darkened toward the apex. Pile short, yellow, moderately dense, but inconspicuous, except on the fifth segment and toward the apex of the fourth. Coxae largely brown, yellowish toward the apex; remainder of legs yellow. Wings hyaline, veins yellow. Third vein simple. The discal cell emits three veins, all long and distinct throughout their entire course. Small cross-vein long, with a considerable slant. Discal cross-vein extremely short, apparently almost absent.

Type: Male, Galveston, Texas, May. (F. H. Snow). Paratype; 1 male, same data.

**Nemotelus beameri** new species.

Female. A shining black species; the facial prominence long, its upper margin, viewed laterally, forming a continuous gently sloping line with the vertex. Antennae inserted near the base of the facial prominence; porrect, black. Style short. Thorax narrowly margined with yellow. Squamae yellowish. Halteres white. Abdomen wholly shining black. Middle and hind femora, except apices, black; middle tibiae yellow; hind tibiae largely black; middle tarsi yellow; hind tarsi and all of anterior pair of legs missing in the type. Wings hyaline; third vein simple. Pile of body very sparse, white. Length, 4.5 mm.

Type; Female, Northgate, Colo., Aug. 20, 1931 (R. H. Beamer).

This species resembles **N. unicolor** Loew, but the abdomen is somewhat longer and flatter, and the shape of the head is different, the facial prominence being almost twice as long as in **N. unicolor.**

**Nemotelus lambda,** new species.

Male. Shining black, marked with ivory white. Eyes contiguous. Ocellar triangle black; ocelli white. Antennae black; style quite distinct. Front above the antennae black, but the facial orbits are conspicuously white; this marking, because of the contiguity of the eyes, has the form of a Greek lambda. Face, cheeks, and proboscis black; facial prominence very short, similar to that of **N. melanderi** Banks, but not so pointed. Thorax and scutellum black; humeri, pleural margins, and halteres ivory white. Lower squamae white. Ab-

domen black, with conspicuous white lateral margins; these margins run in somewhat along the posterior margin of the fourth segment; the lateral margins are obsolete on the first and fifth segments. Venter black: the second and third segments with conspicuous white lateral and posterior margins. Pile of thorax and abdomen sparse, white. Femora black, with white apices; tibiae yellow; tarsi white. Veins of wings whitish, almost concolorous with the hyaline membrane. Length, 4 mm.

Type: Male, Roosevelt County, N. M., July 7, 1927 (R. H. Beamer).

## NOTES

A trap-light catch of leafhoppers on July 28, 1932, at Lawrence, was the largest the writer had ever seen, so it was decided to count the number of specimens taken. One thousand specimens were counted and weighed and the number in the catch was then estimated by weight. The results showed that there were at least 330,000 leafhoppers in the lot. One wonders how many there were altogether at the lights of the community that night. The main species involved were **Euscelis obscurinervis, Polyamius inimicus** and **Draeculacephala mollipes,** chiefly the first.

Paul B. Lawson.

## PROGRAM
## NINTH ANNUAL MEETING
## KANSAS ENTOMOLOGICAL SOCIETY

April 15, 1933
Room 52, Fairchild Hall
Kansas State College, Manhattan, Kansas.

Kansas Academy of Science and Kansas Entomological Society Joint Session .....8:15 to 9:00 a. m.

Dean, Geo. A.—Blowfly Maggot Therapy in Surgery and Medicine.

Kelly, S. G.—Cocklebur Insects in Kansas for the Purpose of Biological Control of Xanthium in Australia.

Musser, D. R.—Preliminary Observations on the Effectiveness of Some Moth-Proofing Chemical Compounds.

Kansas Academy of Science Business Session 9:00 to 10:00 a. m.

Kansas Entomological Society Business Session

10:00 to 11:00 a. m.

Presentation of Papers .....11:00 to 12:00 a. m.

1. Smith, R. C.—Additions to the Neuroptera of Kansas.
2. Redding, W. V.—Testing an Insect Electrocutor as a Fly Trap in a Dairy Barn.
3. Hungerford, H. B.—Some New Aquatic Hemiptera,
4. Cummings, Carl—Giant Water Bugs of the Western Hemisphere (Hemiptera).
5. Whelan, D. B.—The Mandibles of Cutworms and Armyworms.
6. Nonamaker, H. L.—Collecting Insects at Lights,

Presentation of Papers .....1:30 p. m.

7. Schwardt, H. H.—Biological Notes on the Rare Horse Fly, **Goniops chrysocoma** O. S. (Tabanidae, Diptera)
8. Brennan, James—Notes on the Tabanidae of Kansas.
9. Allen, M. W.—Wheat Stem Maggot (**Meromyza americana** Fitch, Chloropidae, Diptera).
10. Collins, C. R.—Insecticide Tests in the Control of the Corn Earworm (**Heliothis absoleta** Fab., Noctuidae, Lepidoptera).
11. Sanderson, Milton—Notes on Parnidae (Coleoptera)
12. Bryson, H. R.—The Elateridae of Kansas (Coleoptera)
13. Kruger, F. S.—Food Habits of Wireworms (Elateridae, Coleoptera)
14. Wilbur, D. A.—Some Grasshopper Damage to Grass Heads.
15. Lawson, P. B.—The Genus Fitchiella (Fulgoridae, Homoptera)
16. Nottingham, Jonathan — The Genus Draeculacephala (Cicadellidae, Homoptera).
17. Beamer, R. H.—New Leafhopper of the Deltocephalus Group (Cicadellidae, Homoptera)
18. Painter, R. H. and Snelling, R. O.—The Probability of a Third Generation of Chinch Bugs (**Blissus leucopterus** Say, Lygidae, Hemiptera) in Southwestern Oklahoma.
19. Readio, P. A.—The Genus Stenapoda (Reduviidae, Hemiptera).

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## CONTENTS OF THIS NUMBER

A SUMMARY OF THE POPULATION OF INJURIOUS INSECTS IN KANSAS FOR 1932—ROGER C. SMITH AND E. G. KELLY ..... 37

LIFE HISTORY OF THE LESSER GRAIN BORER—H. H. SCHWARDT ..... 61

NEW STRATIOMYIDAE IN THE SNOW ENTOMOLOGICAL COLLECTION—MAURICE T. JAMES ..... 66

NOTES—PAUL B. LAWSON ..... 71

NINTH ANNUAL MEETING KANSAS ENTOMOLOGICAL SOCIETY ..... 71

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